AMAX-2240 Series

4-Axis AMONet RS-485
Motion Slave Modules

User Manual

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2nd Edition

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3. If your product is diagnosed as defective, obtain an RMA (return merchandize authorization) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a fully-completed Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.
5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

CE

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This kind of cable is available from Advantech. Please contact your local supplier for ordering information.

Technical Support and Assistance

Step 1. Visit the Advantech web site at **www.advantech.com/support** where you can find the latest information about the product.

Step 2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before you call:
- Product name and serial number
- Description of your peripheral attachments
- Description of your software (operating system, version, application software, etc.)
- A complete description of the problem
- The exact wording of any error messages

Packing List

Before setting up the system, check that the items listed below are included and in good condition. If any item does not accord with the table, please contact your dealer immediately.

In addition to this User Manual, the package should also include the following items:

1. AMAX-2240 Series: 4-Axis AMONet RS-485 Motion Slave Modules
2. Advantech Driver Disc

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CHAPTER 1

Introduction

This chapter gives an overview of the product features, and specifications for AMAX-2240 Series

Sections include:

- Features
- Specifications

Chapter 1 Introduction

Products in the AMAX-2240 Series are used to increase the number of axes for an AMONet RS-485 distributed motion control network. These extension slave modules connect serially by a simple and affordable Cat.5 LAN cable, reducing the wiring between driver and controller. This is very suitable for highly integrated machine automation applications.

AMONet RS-485 has driver specific motion slave modules to support a range of common motor vendors such as: Mitsubishi J2-Super series, Panasonic Minas A type, and Yaskawa Sigma-II. Please select the respective cable SCSI-20P or SCSI-50P and plug this cable into the motor driver and motion slave module.

1.1 Features

- Max. 6.5MHz pps, 4-axes pulse output
- Programmable baud-rate up to 20Mbps transfer rate
- 3 x 28-bits counter
- Easy installation with RJ45 phone jack and LED diagnostic
- Programmable acceleration and deceleration time
- T-curve and S-curve velocity profiles support
- Changes speed on-the-fly
- Independent 4-axis motion control
- 2~4 axes linear interpolation function with auto ramping-down point
- 2-axis circular interpolation function with auto ramping-down point
- Continuous interpolation function with auto ramping-down point
- Auto position compare output up to 100 KHz
- Table position compare output up to 4 KHz

1.2 Specifications

1.2.1 Axes

Number of Axes	4 Axes	
Drive Output Pulses	Positioning control Range	-134217728~+134217728 (28-bits)
	Acceleration/ Deceleration	1 to 65535 (16-its)
	Drive Speed	MAX : 6.5Mpps min : 0.1pps
	Pulse Output Type	Pulse/Direction(1-pulse, 1-direction type) or Up/Down(2-pulse type) or A/B phase
	Counter	Counter1 : Command position counter (28-bits) Counter2 : Mechanical position counter Counter3 : Deflection counter
	Precision	0.5LSB
	Output Signal Modes	Differential line driving output
	Speed Curve	T/S-curve Acceleration/Deceleration
2~4-Axes Linear Interpolation	Range	-134217728~+134217728 for each axis
	Speed	0.1~6.5Mpps
	Precision	0.5LSB
2-Axes Circular Interpolation	Range	-134217728~+134217728 for each axis
	Speed	0.1~6.5Mpps
	Precision	0.5LSB

1.2.2 Encoder Input

Input Pulse for Encoder Interface	Input Signal	nEA/nEB/nEC
	Encoder Pulse Input Type	Quadrature (A/B phase) or Up/Down
	Counts per Encoder Cycle	x1, x2, x4 (A/B phase only)
	Max. Input Frequency	2MHz @ 5V
	Protection	2,500V Isolation

1.2.3 Digital Input/Output

Input Signal	Mechanical Input	+EL, -EL, ORG, SD
	Input Signal for Servo Motor Drives	ALARM (servo alarm) INPOS (position command completed) RDY (ready) LTC (latch counter)
	Emergency Stop	EMG-one emergency stop input for AMAX-224X series
	Protection	2,500 V Isolation
Output Signal	Signal	SVON (servo on) RALM (reset alarm) ERC (error clear) CMP (compare output)
	Output Type	Sink Type (open collector 5~30V)
	Sink Current	500mA per channel, 1.1A total for X and Y 1.1A total for Z and U
	Protection	2,500 V Isolation

Note: “n” represents the axis (X, Y, Z, or U) concerned.

1.2.4 General

I/O ConnectorType	AMAX-2241	4*SCSI-50 (ribbon type) + 1*40pin pluggable connector
	AMAX-2242	8*SCSI-20 (ribbon type) + 1*40pin pluggable connector
	AMAX-2243	4*SCSI-50 (ribbon type) + 1*40pin pluggable connector
Dimensions		
Power Consumption	Typical	210mA @ 24V
	Max	250mA @ 24V
External Power Voltage	AMAX-2241	24V±10%
	AMAX-2242	
	AMAX-2243	
Module Power Input Range	24V±10%, ripple within 200mV	

CHAPTER 2

Hardware Functionality

This chapter shows the hardware functionality of AMAX-2240 Series

Sections include:

- PCB Board Layout
- Power Connector
- AMONet Interface
- BoardID Switch
- Configuration Setting
- LED Definition
- CN5 Pin Definition
- Motion Signal Connection

Chapter 2 Hardware Functionality

2.1 PCB Board Layout

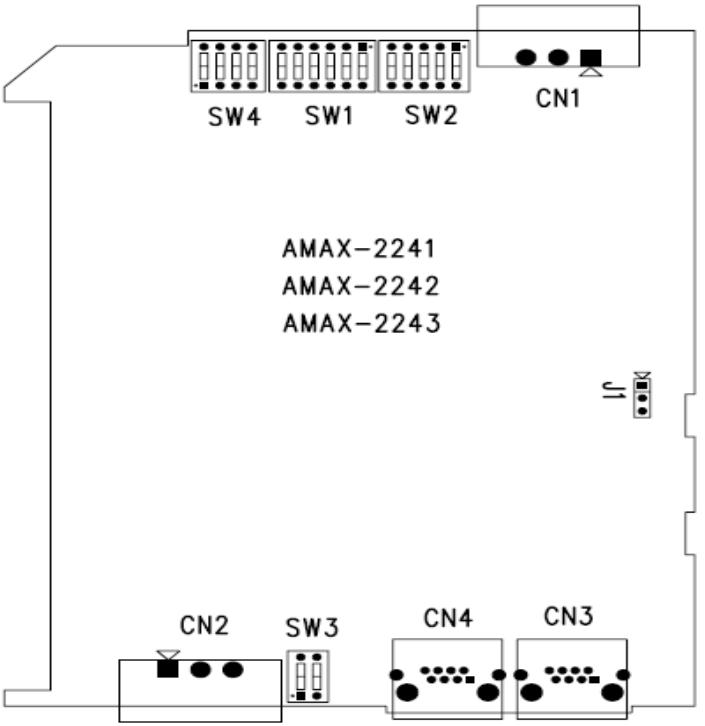


Figure 2.1: PCB Layout of the AMAX-2240 Series L1

Name	Description
CN1	Module Power
CN2	External Power and EMG Input
CN3	AMONet Connector
CN4	AMONet Connector
SW1	Board ID Switch
SW2	Configuration Setting
SW3	Configuration Setting
SW4	Configuration Setting

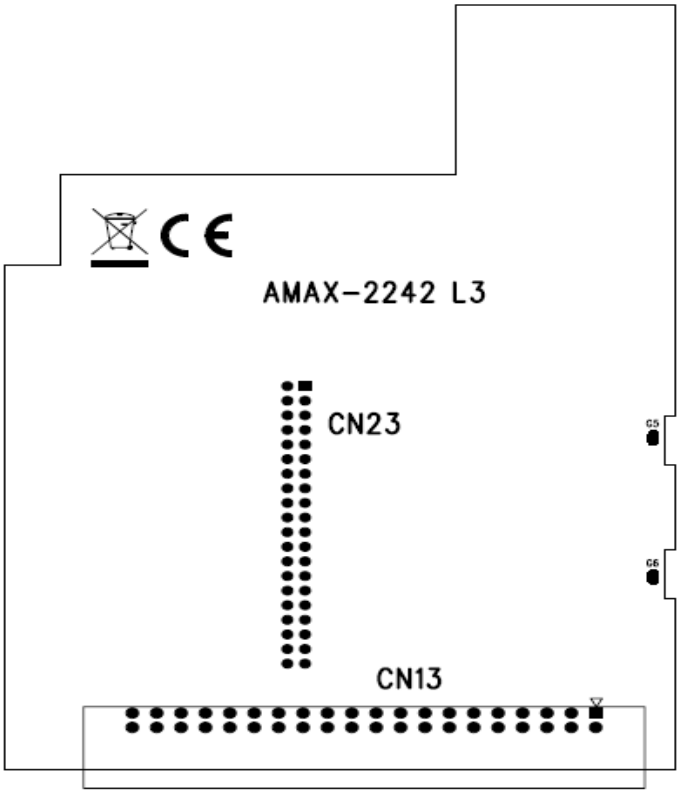


Figure 2.2: PCB Layout of the AMAX-2242 L3

Name	Description
CN5	External Connector

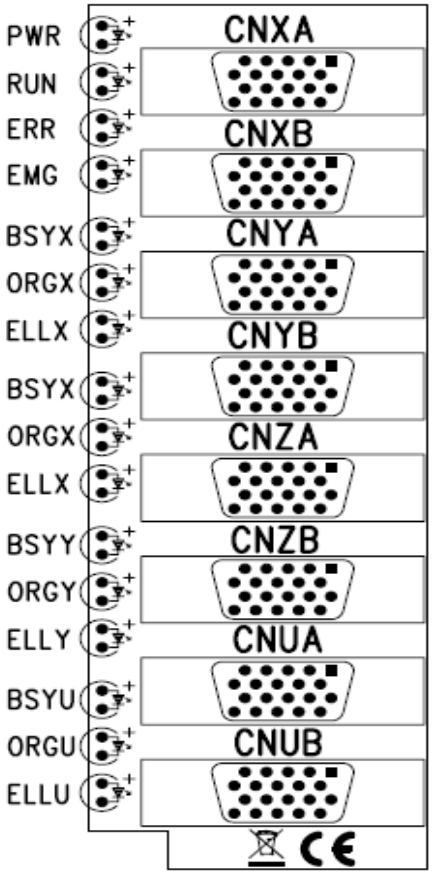


Figure 2.3: PCB Layout of the AMAX-2242

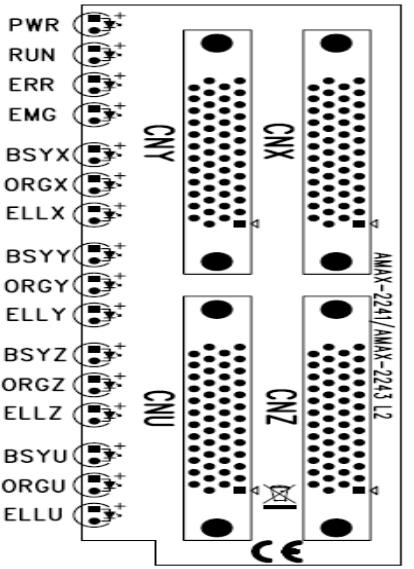


Figure 2.4: PCB Layout of AMAX-2241/2243 L2

Name	Description
CNXA,CNYA,CNZA,CNUA	SCSI-20 pins Connector for Mitsubishi Driver CNA
CNXB,CNYB,CNZB,CNUB	SCSI-20 pins Connector for Mitsubishi Driver CNB
CNX,CNY,CNZ,CNU	SCSI-50 pins Connector for Panasonic or Yaskawa Driver

Name	Description
PWR	Power LED
RUN	Communication LED
ERR	Communication Error LED
EMG	Emergency Stop LED
BSYn	Busy LED for n Axis
ORGn	Origin LED for n Axis
ELLn	LMT+ or LMT- LED for nAXIS

*n means X or Y or Z or U

2.2 Power Connector

2.2.1 Module Power Connector (CN1)

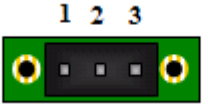


Table 2.1: Power Connector Pins (CN1)	
Pin	**Signal Name**
1	+VS (24V)
2	GND
3	Field Ground

2.2.2 External Power Connector (CN2)

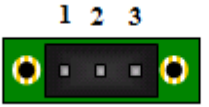


Table 2.2: External Power Connector Pins (CN2)		
Pin	**Signal Name**	
1	+EVS	
	AMAX-2241/PMA	(24V±10%)
	AMAX-2242/J2S	
	AMAX-2243/YS2	
2	EGND	
3	EMG : Emergency STOP Input (Connect to EGND to inactive this signal	

2.3 AMONet Interface

2.3.1 AMONet Extension (CN3, CN4)

Pin	Label	Description
1	FG	Field Ground
2	FG	Field Ground
3	RS485+	High Speed RS-485 protocol
4	FG	Field Ground
5	FG	Field Ground
6	RS485-	High Speed RS-485 protocol
7	FG	Field Ground
8	FG	Field Ground

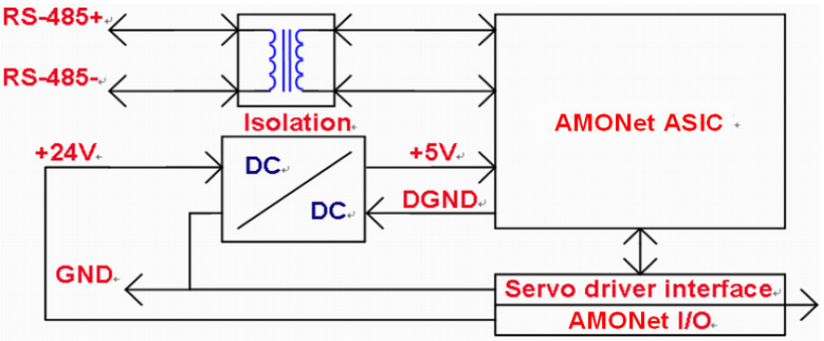


Figure 2.5: RS-485 Extension Port

2.3.2 AMONet Extension Interface

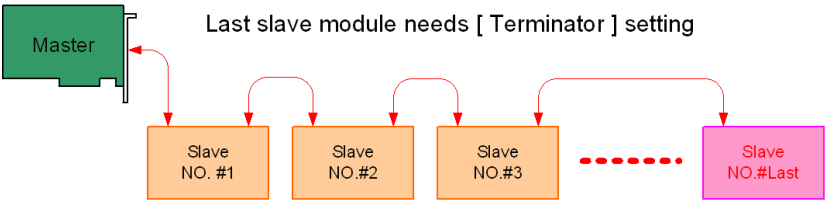


Figure 2.6: AMONet Slave Module Address Setting

2.4 Board ID Switch (SW1)

Pin	Label	ON	OFF
1	DN5	1	0
2	DN4	1	0
3	DN3	1	0
4	DN2	1	0
5	DN1	1	0
6	DN0	1	0

Note: Node Number=32xDN5+16xDN4+8xDN3+4xDN2+2xDN1+DN0

Default Setting: All the switches are in OFF status

2.5 Configuration Setting (SW2)

Switch	Label	Description	ON	OFF
1	SPD1	Baud-Rate Setting	0	1
2	SPD0		0	1
3	TUD	Time-Out Status Latch	Disable	Enable
4	TMD	Select Watchdog Timer	Low	High
5	BRK	*Break and Rescan Communication	Disable	Enable

Note: BRK is reserved

How to Use the Baud-Rate Setting

SPD0	SPD1	Baud-Rate Setting
OFF	OFF	1/4 System Clock
OFF	ON	1/8 System Clock
ON	OFF	1/16 System Clock
ON	ON	1/32 System Clock

Note: default system clock = 80 MHz

Default Setting: All the switches are in OFF status

TUD: When TUD = OFF --- The LSI keeps its current status.When the TUD = ON --- Reset I/O port output, and immediately stops pulse output (stop operation).

TMD: *Specify the time for the watchdog timer. The watchdog timer is used to administer the communication status. When the interval between data packets sent from a central devices is longer than the specified interval, the watchdog timer times out (the timer restarts its count at the end of each data packet received from a central device). The time out may occur because of a problem on the communication circuit, such as disconnection, or simply because the central device has stopped communication.*

The time used by the watchdog timer varies with communication speed selected.

Table 2.3: TMD				
TMD terminal	Watchdog Timer Setting			
	20 Mbps	10 Mbps	5 Mbps	2.5 Mbps
Low	5ms	10ms	20ms	40ms
High	20ms	40ms	80ms	160ms

2.6 Configuration Setting (SW3)

Switch	**Label**	**ON**	**OFF**
1	No Use		
2	Terminal Resistor	With TR	Without TR

Default Setting: Switches are in OFF status

2.7 Configuration Setting (SW4)

Switch	Label	ON	OFF
1	EL_XL	N.C.	N.O.
2	EL_YL	N.C.	N.O.
3	EL_ZL	N.C.	N.O.
4	EL_UL	N.C.	N.O.

2.8 LED Definition

Table 2.4: AMAX-2240 Series LED Definition

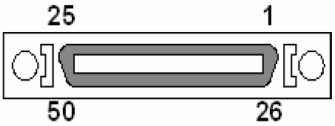
LED	Description
PWR	Power
RUN	Communication
ERR	Communication Error
EMG	Emergency Stop
ORGn	For n Axis
ELLn	ELL+ or ELL- for n Axis
BSYn	For n Axis

2.9 CN5 & CN6 Pin Definition

2.9.1 CN5 for AMAX-2240

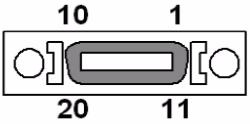
Pin	Label	Type	Pin	Label	Type
1	CMP_U	Output	2	LTC_U	Input
3	EGND	PWR	4	+EVS	PWR
5	SD_U	Input	6	ORG_U	Input
7	EGND	PWR	8	+EVS	PWR
9	EL-_U	Input	10	EL+_U	Input
11	CMP_Z	Output	12	LTC_Z	Input
13	EGND	PWR	14	+EVS	PWR
15	SD_Z	Input	16	ORG_Z	Input
17	EGND	PWR	18	+EVS	PWR
19	EL-_Z	Input	20	EL+_Z	Input
21	CMP_Y	Output	22	LTC_Y	Input
23	EGND	PWR	24	+EVS	PWR
25	SD_Y	Input	26	ORG_Y	Input
27	EGND	PWR	28	+EVS	PWR
29	EL-_Y	Input	30	EL+_Y	Input
31	CMP_X	Output	32	LTC_X	Input
33	EGND	PWR	34	+EVS	PWR
35	SD_X	Input	36	ORG_X	Input
37	EGND	PWR	38	+EVS	PWR
39	EL-_X	Input	40	EL+_X	Input

2.9.2 CNX/Y/Z/U for AMAX-2241/PMA



PIN	Label	Used	PIN	Label	Used
1		No	26	ZEROSPD	No
2		No	27	GAIN	No
3	PULS1	Yes	28	DIV	No
4	PULS2	Yes	29	SRV-ON	Yes
5	SIGN1	Yes	30	CL	Yes
6	SIGN2	Yes	31	A-CLR	Yes
7	COM+	Yes	32	C-MODE	No
8	CWL	No	33	INH	No
9	CCWL	No	34	S-RDY-	Yes
10	BRKOFF-	Yes	35	S-RDY+	Yes
11	BRKOFF+	Yes	36	ALM-	Yes
12	ZSP	No	37	ALM+	Yes
13	GND	Yes	38	COIN-	Yes
14	SPR/TRQR	No	39	COIN+	Yes
15	GND	No	40	TLC	No
16	CCWTL/TRQR	No	41	COM-	No
17	GND	No	42	IM	No
18	CWTL	No	43	SPM	No
19	CZ	No	44	BATT+	No
20		No	45	BATT-	No
21	OA+	Yes	46		No
22	OA-	Yes	47		No
23	OZ+	Yes	48	OB+	Yes
24	OZ-	Yes	49	OB-	Yes
25	GND	No	50	FG	No

2.9.3 CNX/Y/Z/UA & CNX/Y/Z/UB for AMAX-2242/J2S



CNX/Y/Z/UA				CNX/Y/Z/UB		
PIN	Label	Used		PIN	Label	Used
1	LG	No		1	LG	No
2	NP	Yes		2		No
3	PP	Yes		3	VDD	No
4	P15R	No		4	DO1	No
5	LZ	Yes		5	SON	Yes
6	LA	Yes		6	TLC	No
7	LB	Yes		7		No
8	CR	Yes		8	PC	No
9	COM	Yes		9	TL	No
10	SG	Yes		10	SG	Yes
11	OPC	No		11	P15R	No
12	NG	Yes		12	TLA	No
13	PG	Yes		13	COM	Yes
14	OP	No		14	RES	Yes
15	LZR	Yes		15	EMG	Yes
16	LAR	Yes		16	LSP	Yes
17	LBR	Yes		17	LSN	Yes
18	INP	Yes		18	ALM	Yes
19	RD	Yes		19	ZSP	Yes
20	SG	Yes		20	SG	Yes

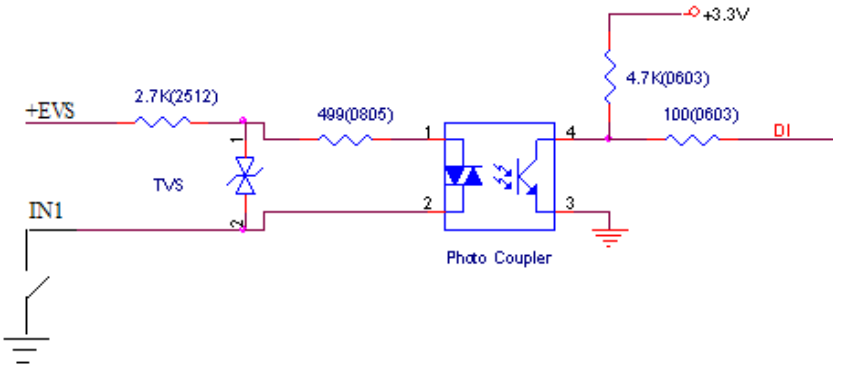
2.9.4 CNX/Y/Z/U for AMAX-2243/YS2

PIN	Label	Used	PIN	Label	Used
1	SG	No	26	/VMP-	Yes
2	SG	No	27	/TGON+	Yes
3	PL1	No	28	/TGON	Yes
4	SEN	No	29	/S-RDY+	Yes
5	V-REF	No	30	/S-RDY	Yes
6	SG	No	31	ALM+	Yes
7	PULS	Yes	32	ALM	Yes
8	*PULS	Yes	33	PAO	Yes
9	T-REF	No	34	*PAO	Yes
10	SG	No	35	PBO	Yes
11	SIGN	Yes	36	*PBO	Yes
12	*SIGN	Yes	37	AL01	No
13	PL2	No	38	AL02	No
14	*CLR	Yes	39	AL03	No
15	CLR	Yes	40	/S-ON	Yes
16	-	No	41	P-CON	No
17	-	No	42	P-OT	Yes
18	PL3	No	43	N-OT	Yes
19	PCO	Yes	44	/ALM-RST	Yes
20	*PCO	Yes	45	/P-CL	No
21	BAT+	No	46	/N-CL	No
22	BAT-	No	47	+24-IN	Yes
23	-	No	48	PSO	No
24	-	No	49	POS	No
25	/V-CMP+	Yes	50	-	No

2.10 Motion Signal Connection

2.10.1 Digital Input

This includes EL+, EL-, ORG, SD, LTC, EMG, ALM, INP, RDY, signal:



EL+_X/Y/Z/U & EL-_X/Y/Z/U

There are two end-limit signals called EL+ & EL-. The default setting is Normal-Open type signals from external sensors (Can be set by SW4). EL+ indicates the limit of motion in the plus direction and EL- indicates the limit of motion in the minus direction. The relative signal names, pin number are shown in the following table.

Table 2.5: PEL and MEL Pins

Label	Description
EGND	External Ground
EL+	Plus End Limit
EL-	Minus End Limit

ORG _X/Y/Z/U (Origin)

The origin signal is necessary when the position feedback is of the incremental type or if no feedback encoders are used. The origin signals are used to indicate the origin of the system.

Table 2.6: ORG Pins	
Label	**Description**
EGND	External Ground
ORG	ORG signal

SD _X/Y/Z/U (Slow Down)

SD signals are used to help the axis decelerate to stop by hardware.

Table 2.7: SLD Pins	
Label	**Description**
EGND	External Ground
SLD	SLD Signal

ALM (Servo Alarm)

ALM- input signal from ALM signal at servo driver. The servo driver will issue ALM output when it is under abnormal operation or overload.

Table 2.8: ALM Pins	
Label	**Description**
EGND	External Ground
ALM	Servo ALM input

INP (Servo In Position)

INP is used to read the INP status inside servo driver.

Table 2.9: INP Pins	
Label	**Description**
EGND	External Ground
INP	Servo In-Position Input

RDY (Driver Ready)

RDY is an input signal and is used to read the RDY signal at servo driver.

Table 2.10: RDY Pins	
Label	**Description**
EGND	External Ground
RDY	Servo RDY input

LTC _X/Y/Z/U (Counter Latch)

LTC is used to latch the value in the counter when the LTC input is active.

Table 2.11: LTC Pins	
Label	**Description**
LTC	LTC- Input
EGND	External Ground

EMG (Emergency Stop)

Table 2.12: EMG Pins	
Label	**Description**
EMG	Emergency Stop
EGND	External Ground

2.10.2 Digital Output

This section includes SVON, ERC, RALM, CMP, signal:

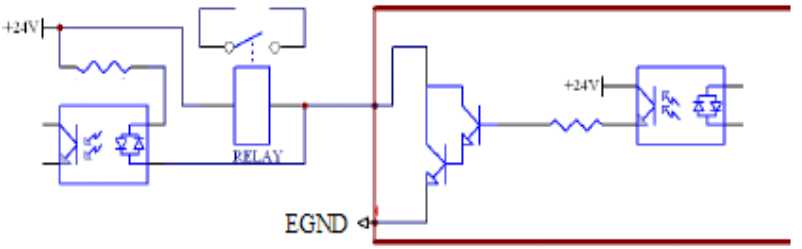


Figure 2.7: Relay Type Output

SVON (Servo On)

SVON is an output signal used to make driver servo-on to hold the motor.

Table 2.13: SVON Pins	
Label	**Description**
SVON	SVON Output
EGND	External Ground

ERC (Reset Driver Error Counter/Deviation Counter Clear)

ERC output will be active when the following conditions are activated.

- Homing is complete
- PEL/MEL is active
- ALM is active
- User issues EMG by software

For safety reasons, please issue ERC before SVON.

Table 2.14: ERC Pins	
Label	**Description**
ERC	Reset Driver error Counter
EGND	External Ground

RALM (Reset Servo Alarm)

This RALM signal is designed to reset ALM status inside the servo driver if the alarm status can be reset.

Table 2.15: RALM Pins	
Label	**Description**
EGND	External Ground
RALM	ALM reset output

CMP _X/Y/Z/U (Position Compare)

CMP signals are used to make a comparison between target value and actual value and generate a trigger signal output.

Table 2.16: CMP Pins	
Label	**Description**
CMP	CMP Output
EGND	External Ground

2.10.3 DDA Pulse Output

OUT and DIR (Pulse Output Control)

There are eight types of pulse output for AMAX-2240 Series. You may select DIR/OUT or CW/CCW or A/B phase.

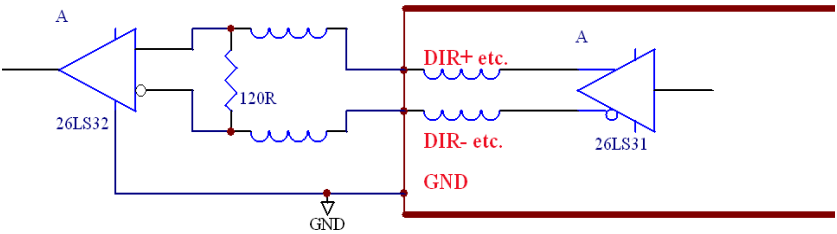


Figure 2.8: Differential Mode

Table 2.17: DDA Pulse Pins	
Label	**Description**
OUT+	OUT(+)
OUT-	OUT(-)
DIR+	DIR(+)
DIR-	DIR(-)

Encoder Feedback Signal

EA, EB, and EZ for differential line driver input.

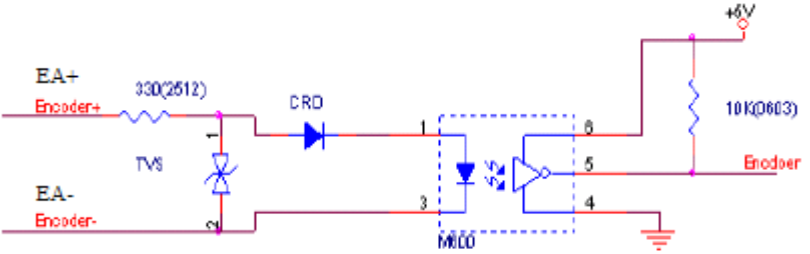


Table 2.18: Encoder Pins	
Label	**Description**
EA+	Encoder A (+)
EA-	Encoder A (-)
EB+	Encoder B (+)
EB-	Encoder B (-)
EZ+	Encoder Z (+)
EZ-	Encoder Z (_)